Flow charts and "C" factors The flow charts

The following three charts show the corresponding friction losses of cast iron and similar water mains; of schedule 40 steel pipe; and Type K copper pipe.

Most field contractors and engineers dealing with the construction and design of water mains are accustomed to thinking of losses in feet of water and flow of gallons per minute as determined by the Williams and Hazen's formula. The flow chart for cast iron and similar mains is based on this formula and expresses the losses as head in feet lost per 1000 feet of pipe at the various flows in gallons per minute.

Service line designers usually are interested in losses expressed in pounds per square inch. The flow charts for schedule 40 steel pipe and Type K copper pipe give the losses as pounds per square inch lost in 100 feet of service line at various flows in gallons per minute.

These latter charts are taken from the Bureau of Standards Publication BMS - 79, with some larger sizes added and with additional scales added for use in estimating special pipes by actual inside diameters. For instance, the chart for Type K copper pipe can be used for plastic pipe and any smooth pipe where the actual inside diameter is known.

In a similar manner the flows through odd size pipes of similar internal roughness to schedule 40 steel and cast iron pipe can also be estimated, since the auxillary inside diameter scales have likewise been added to these charts.

Williams and Hazen "C" fac- tors* for use with flow chart shown on page Eng Info - 24

Values of "C" recommended for use in the Williams and Ha- zen Formula

C = 140 for "extremely smooth and straight pipes" with "continuous interior" and welded or coupled joints, such as New brass, copper, lead, tin. New cast iron. New welded or seamless steel. Smooth concrete (see Scobey concrete formula for full details on various degrees of roughness). Smooth cement-lined cast iron or steel pipe. Asbestos-Cement.

C = 130 for "very smooth" pipes, such as Welded or seamless steel with "continuous interior" in "fair" condition. New welded-steel pipe with riveted girth joints. New cast iron, usual value. Old brass, copper, lead, tin.

C = 120 for "smooth" pipes, such as Smooth wooden pipes or woodstave pipes. Ordinary concrete.

C = 110 - 130 for "new full-riveted" steel or wrought-iron pipe, depending on thickness of plate and extent to which rivets are countersunk (see also Scobey formula).

C = 110 for old cement-lined pipe, or vitrified-crock sewers in good condition

C = 100 for old cast-iron or "old continuous interior" steel pipes where the carrying capacity over a long period of years is somewhat impaired through tuberculation or sedimentation. For sizes below 6 inches, somewhat lower values should be used. Velocities in feet per second and loss of head in feet per 1,000 feet of pipe for C = 100 are given in Table XLIV (see Piping Handbook).

C = 95 for "old full-riveted" steel under the same conditions.

C = 90 for brick sewers.

C = 60 for "corrugated" pipe or "badly tuberculated" iron or steel pipes.

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